

**MEETING SUMMARY
NATIONAL TOXICOLOGY PROGRAM
CENTER FOR THE EVALUATION OF RISKS
TO HUMAN REPRODUCTION**

**EXPERT PANEL EVALUATION OF GENISTEIN AND SOY FORMULA
MARCH 15–17, 2006**

The National Toxicology Program (NTP) Center for the Evaluation of Risks to Human Reproduction (CERHR) convened an expert panel on March 15–17, 2006, in Alexandria, Virginia to evaluate genistein and soy formula. CERHR selected genistein and soy formula for expert panel evaluation because of (1) the availability of reproductive and developmental toxicity studies in laboratory animals and humans, (2) the availability of information on exposures in infants and women of reproductive age, and (3) public concern for effects on infant or child development.

Genistein is a phytoestrogen found in some legumes, especially soybeans. Phytoestrogens are non-steroidal, estrogenic compounds that occur naturally in some plants. In plants, nearly all genistein is linked to a sugar molecule and this genistein-sugar complex is called genistin. Genistein and genistin are found in many food products, especially soy-based foods such as tofu, soy milk, and soy infant formula, and in some over-the-counter dietary supplements. Soy formula is fed to infants as a supplement or replacement for human milk or cow milk.

The expert panel, composed of 14 independent scientists, reviewed and evaluated the available scientific data on genistein and soy formula in three primary areas: human exposure, reproductive toxicity, and developmental toxicity. In their deliberations, the expert panel considered the quality, quantity, and strength of the scientific evidence that exposure to genistein or soy formula might cause adverse effects on human reproduction and/or development of the fetus or infant. The expert panel also identified gaps in the available scientific data on the possible effects of genistein and soy formula and suggested areas where additional research is needed. All members of the panel served as individual experts and not as representatives of their employers or other organizations.

Genistein - Expert Panel Conclusions

Even though there is a paucity of available human data on exposure to purified genistein, the Expert Panel expresses negligible concern for reproductive and developmental effects from exposure of adults in the general population. The most highly exposed human population reported is Japanese adults with ingestion of total genistein (free and complexed) of approximately 0.43 mg/kg body weight (bw)/day. However, adverse effects in rodent studies were not observed at levels below 35–44 mg/kg bw/day. Therefore, the Expert Panel feels that under current exposure conditions, adults would be unlikely to consume sufficient daily levels of genistein to cause adverse reproductive and/or developmental effects.

The Expert Panel expresses negligible concern for adverse effects in neonates and infants who may consume up to 0.01–0.08 mg/kg bw/day of genistein aglycone contained in soy formula. . One member of the panel did not agree with this conclusion and felt that a higher level of concern was warranted. It is noteworthy that about 1% of total genistein in soy formula is present in its uncomplexed form, i.e., the aglycone

Soy Formula - Expert Panel Conclusion

There are insufficient human or experimental animal data available to permit a determination of the developmental or reproductive toxicity of soy infant formula.

The conclusions noted above are those of the Genistein and Soy Formula Expert Panel and should not be construed to represent the views of the NTP.

Next Steps

The final expert panel reports on genistein and soy formula will be posted on the CERHR website (<http://cerhr.niehs.nih.gov>) and available in printed text from CERHR in May 2006. CERHR will solicit public comments on these reports through an announcement in the Federal Register. Following this comment period, CERHR will prepare two NTP-CERHR monographs, one on genistein and one on soy formula, that consist of an NTP brief, the expert panel report, and all public comments on that report. The monographs will be available to the public in PDF format on the CERHR website and in hardcopy by contacting CERHR and will be distributed to appropriate federal health and regulatory agencies.

Background on CERHR

The NTP established CERHR in 1998 as an environmental health resource to the public and to regulatory and health agencies. CERHR provides scientifically based, uniform assessments of the potential for adverse effects on reproduction and/or development caused by human exposure to man-made or naturally occurring chemicals or chemical mixtures. CERHR convenes independent panels of scientific experts to conduct its evaluations. Expert panel meetings are open to the public and the public is invited to nominate scientists to serve on these panels. Following completion of the evaluation of a chemical, the NTP prepares an a NTP-CERHR monograph that contains its opinion on the potential for the chemical to be a reproductive and/or developmental hazard, the expert panel report, and public comments received on the final expert panel report. NTP-CERHR monographs on other chemicals evaluated by CERHR include six phthalates, methanol, 1-bromopropane, 2-bromopropane, ethylene glycol, propylene glycol, fluoxetine, acrylamide, amphetamines, methylphenidate, and styrene. These monographs are available on the CERHR website and in hardcopy or CD from CERHR.

Questions about the expert panel review of genistein or soy formula or about CERHR can be directed to Dr. Michael Shelby, CERHR Director at 919-541-3455 or shelby@niehs.nih.gov.